ORIGINAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

April 4, 2003

Arthur O'Connell
Site and Brownfields Assessment/
State Superfund Division
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

RE: Sampling Plan for the Elkton Farm Thiokol Motor Recovery Area (MD-433)

Dear Mr. O'Connell:

I have received via email and reviewed the sampling plan for the above referenced site. I've also discussed the plan with the project manager, Alex Cox, and approved the locations of the monitoring wells prior to their installation. Based on my review, I am approving the draft sampling plan as written.

Should you have any questions or concerns regarding my review, please call me at (215) 814-3355.

Sincerely,

Lorie Baker

Lorie Baker
Site Assessment Manager

cc: Patti Davis (MDE)
Alex Cox (MDE)
File

PRELIMINARY ASSESSMENT/SITE INSPECTION
SAMPLING PLAN
FOR THE
ELKTON FARM THIOKOL MOTOR RECOVERY AREA
Elkton, MD.

April 2003

Prepared by: Maryland Department of the Environment
Waste Management Administration
Environmental Restoration and Redevelopment Program
1800 Washington Blvd., Suite 625
Baltimore, Maryland 21230

Prepared for: U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

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1.0 Introduction

Under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Maryland Department of the Environment's (MDE) Waste Management Administration will conduct a Preliminary Assessment/Site Inspection (PA/SI) at the Elkton Farm Thiokol Motor Recovery Area (TMRA) site in Elkton, Maryland. The purpose of the PA/SI is to investigate the potential threat to human health and the environment posed by the site. The scope of the investigation will include collecting source samples of on-site soil and nearby surface waters to verify types and concentrations of hazardous wastes associated with the site and collecting groundwater samples to test migration hypotheses. These samples are needed to further characterize the site.

This sampling proposal is submitted to the U.S. Environmental Protection Agency (EPA) by the MDE's Environmental Restoration and Redevelopment Program (ERRP), Site and Brownfields Assessments/State Superfund Division.

2.0 Site Description

The TMRA site is located on a farm at 183 Zeitler Road, Elkton, Maryland. The farm consists of approximately 328 acres and is situated in a rural setting just north of Triumph Industrial Park. The farm is currently owned by MARVA Limited Partnership.[1] The 1-acre TMRA portion of the property is located on the USGS Bayview/Newark West 7.5 minute quadrangles at approximately 39°37' north latitude and 75°52' west longitude and has a Maryland grid coordinate of 655000N and 1115000E.[2] The TMRA area is at 100 feet above mean sea level in coastal plain alluvium.

Throughout most of its history, the Elkton farm site has been used as a livestock farm with much of the surrounding fields under cultivation. However, during the period between the end of World War II and the 1970s, hazardous material was stored and/or disposed of on the farm.[3] Four units of disposal have been identified: Unit 1 is an area of the farm that was used by the property owner for the storage of hazardous waste including drums of ash produced from the Thiokol area and ordnance from the Triumph Explosives Inc. (TEI) operation. Unit 2 is an area used during the 1940s by TEI who controlled the property and operated a waste ordnance combustion pit know as the "Firehole." Unit 4 is an area used during this same era, waste organic solvents were disposed of on property controlled by TEI. Unit 3, the object of this study, is a 1-acre plot of land leased by the Thiokol Corporation for the operation of a rocket motor cleaning and recovery area.

In the late 1950s and early 1960s, the Thiokol Corporation leased the one-acre plot of land on the Elkton farm property to test burn rocket fuels and to clean and recover rocket motors.

The structural ruins of this "recovery" area are located on the west side of Elkton Farm immediately south of the "firehole" and between the farm's dirt access road and Laurel Run (Figure 3). The motor recovery area consists of one cinderblock and reinforced concrete building, three reinforced concrete foundations and three metal gantries. A geophysical survey of the area documented four underground anomalies, which may be underground chambers or storage tanks, in addition to the aboveground structures (Figure 4).

3.0 Previous Studies

Unit 1 – Elkton Farm

On October 15, 1991, after the owner contacted EPA and indicated that drums of waste from Galaxy Chemical were stored in a barn, the Roy F. Weston Corporation Technical Assistance Team (TAT) performed a site assessment of Unit 1 by order of the EPA Region III On Scene Coordinator (OSC). MDE accompanied TAT during the site visit. Fifty-three 55-gallon drums of suspected hazardous material were discovered to be stored in a barn and outbuilding on the farm. Aqueous samples were taken from each of the drums in both the barn and outbuilding, along with one sludge sample from a leaking drum in the outbuilding. Results indicated that all samples were high in cyanides, four were weakly acidic, four were flammable and one was extremely caustic with a pH of 14.

The OSC determined that the site met criteria for an emergency removal action and on February 24, 1992, EPA's Region III OSC, TAT, and Environmental Technology Incorporated (ETI) met at the site to begin cleanup. All drums were sampled. In conjunction with this sampling, a sample of soil from the outbuilding, and a background soil sample near the outbuilding were also collected. Samples were analyzed by AnalytiKEM Inc. Results indicated that 24 drums contained flammable organic compounds, one drum contained base neutral compounds, one drum contained halogenated organic compounds, and 27 drums contained inert solids. Soils comprising the outbuilding's floor were classified as non-hazardous. All drums were overpacked and 10 tons of contaminated soil were removed by Environmental Technologies Incorporated. Land Waste Disposal Inc. of Calvert City, Kentucky, handled the disposal of all the drums and Clean Harbors of Baltimore, Maryland handled the disposal of excavated soil from the outbuilding. On August 19, 1992, the EPA Region III OSC declared the site closed.[4]

In April 2001, MDE performed a site survey of the entire Elkton Farm site to determine whether further action was necessary. The finding of this survey was that further action was required in order to document potential hazards associated with a release of site contaminants to the ground and surface waters of the State of Maryland.[5]

Unit 2 - Firehole

A document review revealed the presence of a significant potential source of contamination on the southwestern portion of the Elkton Farm. From 1943 through 1945, TEI operated a waste explosives disposal pit referenced in the company's newsletter as the "firehole." The exact location of this "firehole" was not documented in the reports but the farm's owner remembered the general area. A non-intrusive investigation of the suspected area of the Firehole was conducted in order to refine the Unit 2 sampling plan. Surface resistivity, ground penetrating radar, and other pertinent non-intrusive techniques were used in this characterization study. The site was surveyed and a grid laid out over the site and data collected and referenced to the grid. A well-defined rectangular subsurface anomaly was detected in the general area identified by the property owner as the location of the firehole. Samples, collected in the defined firehole in October 2002, documented nitro-aromatic compounds including Trinitrotoluene (TNT) in subsurface soils. Samples of groundwater to document migration of contaminants at Unit 2 are pending.

Unit 3 – TMRA

In July 2002, a non-intrusive investigation of the suspected area of the TMRA was conducted in conjunction with the investigation of the firehole.[6] Geophysical data defined four discrete subsurface anomalies associated with the abandoned TMRA area. These anomalies are believed to consist of underground storage tanks (UST), or underground sumps, conduits and chambers used during the operation of the facility. One anomaly in the northwest corner of the site is flooded, and has a manway entrance. The remaining three anomalies are unknowns, but they exhibit uniformly squared shapes which might be associated with USTs. Figure 4 details the locations of the anomalies in reference to the site grid and aboveground structures.

Unit 4 – Solvent Contamination Area

Unit 4 area has not been directly addressed by an environmental assessment. However, investigations of Triumph Industrial Park properties immediately south of Unit 4 revealed the presence of a significant groundwater contaminant plume at the northern property boundary. In the fall of 2001, a site investigation of the G. E. Railcar Repair Facility (MD-294) at Triumph Industrial Park documented benzene, chlorobenzene, tetrachloroethene, 1,1,2,2-tetrachloroethane, and trichloroethene in groundwater.

4.0 Site Investigation

An environmental assessment of the soils, sediments, groundwater and surface waters of the TMRA will be addressed in this site investigation. The location of samples will be based on data collected during the geophysical assessment of the area which was conducted in July 2002. This study will utilize direct push technology to characterize site soil and for the collection of subsurface soil samples. Monitoring wells will be installed to obtain samples of the upper water-bearing zone groundwater. Surface water and sediment samples will be collected from Laurel Run upstream and downstream of the site. Sediment samples will also be collected from areas adjacent to the contamination zone, where appropriate.

Soil samples will be collected from the gridded area, referenced in the previous section, to quantify the extent of contamination. Samples will be collected using EnCore 5g soil samplers, sample trowels, bucket augers, and a Geoprobe® direct push drill rig. Analysis for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), nitrogenous compounds, and heavy metals will be done to determine the presence of hazardous and/or explosive compounds. All samples will be field screened for metals, carcinogenic polyaromatic hydrocarbons (cPAH), polychlorinated biphenyls (PCB) and pesticides to determine if there are any "hot spots." Samples from identified "hot spots" will be forwarded to a fixed laboratory for detailed analysis.

5.0 Sample Collection Proposal

Samples are proposed for collection from the groundwater, surface water, sediment and soil both on and in the vicinity of the site. These samples will be collected and submitted for analysis in accordance with the EPA Contract Laboratory Program (CLP) - Routine Analytic Services (RAS) and Special Analytic Services (SAS.) The samples will be analyzed for both the Target Analyte List for inorganics and Target Compound List for organics. Additional analyses for perchlorates and nitrogenous compounds will be completed on samples collected from "hot spots." All samples will be collected in four sample matrices: one organic aqueous, one organic solid, one inorganic aqueous, and one inorganic solid.

CLP protocol will be followed throughout the sample collection and submittal process (U.S. EPA, "Users Guide to CLP," December 1988). The Quality Control (QC) used by MDE includes the submittal of a field duplicate for each matrix, as defined above. In addition, each matrix will also have one sample designated as the spike sample, which will be collected at specified additional volumes for CLP matrix spike QC procedures. Finally, a field blank will be provided for all aqueous matrices. This field blank will consist of deionized water provided by the Department of Health and Mental Hygiene. This water will be transported to the field the day of sample collection and transferred to the appropriate sample containers. Should more than

one day be required for sample collection, then samples will be shipped daily to the appropriate labs. Aqueous volatile organic compound analysis (VOA) trip blank samples will be included with each day's organic shipment. The trip blank consists of deionized water fixed with HCl, and contained in VOA sample containers.

5.1 Groundwater Samples

A total of five groundwater samples are proposed to be collected on and in the vicinity of the Elkton Farm TMRA site property. Groundwater samples in this sampling plan will be designated as GW-#. A sample will be collected from the residential well (GW-D1) located at the Herron's farmhouse. This sample will document background conditions in the lower aquifer. The "firehole" well, GW-1 will serve as the TMRA site background sample for the first water-bearing zone. This sample will be collected from the monitoring well installed upgradient of the TMRA on the uncultivated area south of Zeitler Road and west of the gravel entrance road. GW-T1, GW-T2, and GW-T3 will be collected from three on-site monitoring wells installed during the investigation. All monitoring wells will be installed using an air rotary drill rig and 2-inch threaded PVC monitoring wells will be set and developed in the first water bearing zone. GW-T1 will be located in the geographic center of the 1-acre TMRA parcel. GW-T2 will be sited on the southwestern edge of the TMRA, hydraulically downgradient of the area of concern. GW-T3 will be sited on the northeast edge of the 1-acre parcel upgradient of the area of concern. Figure 5 details the proposed location of these wells.

5.2 Surface Water and Sediment Samples

A total of four surface water/sediment samples plus one duplicate are proposed for collection in the vicinity of the Elkton Farm TMRA site. An aqueous and sediment sample will be collected from each location. Aqueous samples are designated as SW-# and sediment samples are designated Sed-#. All samples will be collected from Little Elk Creek and Laurel Run (Figure 5). Additionally, samples will be collected from two on-site sumps.

Samples SW-1/Sed-1 will be collected upstream from the site at where Zeitler Road crosses over Laurel Run. These samples will serve as the respective background samples for surface water and sediment.

Samples SW-2/Sed-2 will be collected from an area of Laurel Run due west of the TMRA areas central structure.

SW-3/Sed-3 are proposed to be collected from Little Elk Creek upstream of the confluence with Laurel Run.

SW-4/Sed-4 are proposed to be collected from Little Elk Creek ½ mile downstream of its confluence with Laurel Run.

Samples SW-5/Sed-5 will be duplicated at the SW-2/Sed-2 location.

5.3 Soil Samples

A total of twenty-eight soil samples, fourteen surface, fourteen subsurface, plus two duplicate samples are proposed for the TMRA site (Figure 4). Surface soil samples are designated S-# and will be grab samples obtained by a hand trowel, geoprobe or hand auger. Subsurface soil samples will be designated SS-# and will be collected from Geoprobe borings at 4 feet below grade.

The area background sample (S/SS-1) is located on the edge of the wooded property directly northwest of the site. S-2 through S-14 will be collected from select points on the grid laid out over the TMRA area. S/SS-15 will be a duplicate of S-5.

6.0 Sample Summary Table

Sample Identification	Sample Type	Sample Location	Rationale
GW-D1	Aqueous	Farm Domestic Well	Deep Background.
GW-1	Aqueous	Firehole up gradient well	Characterize off-site groundwater.
GW-T1	Aqueous	TMRA – Center	Characterize site groundwater.
GW-T2	Aqueous	TMRA – SW	Characterize on-site groundwater.
GW-T3	Aqueous	TMRA - NE	Characterize on-site groundwater.
SW-1	Aqueous	Laurel Run at Zeitler Road	Background.
SW-2	Aqueous	Laurel Run adjacent	Determine if waste source has traveled off site.
SW-3	Aqueous	Little Elk Creek upstream	Determine if waste source has traveled off site.
SW-4	Aqueous	Little Elk Creek downstream	Determine if waste source has migrated to tributary.
SW-5	Aqueous	Laurel Run confluence	Duplicate Sample of SW-2.
P-1	Aqueous	TMRA Sump	Characterize ponded water in TMRA
P-2	Aqueous	TMRA Manhole Sump	Characterize ponded water in TMRA
Sed-1	Sediment	Laurel Run at Zeitler Road	Background.
Sed-2	Sediment	Laurel Run adjacent	Determine if waste source has traveled off site.
Sed-3	Sediment	Little Elk Creek upstream	Determine if waste source has traveled off site.
Sed-4	Sediment	Little Elk Creek downstream	Determine if waste source has migrated to tributary.
Sed-5	Sediment	Laurel Run confluence	Duplicate Sample of SED 2.
S/SS-1	Soil	Woods NW of Site	Background.
S/SS-2	Soil	Select Grid	Characterize waste source.
S/SS-3	Soil	Select Grid	Characterize waste source.
S/SS-4	Soil	Select Grid	Characterize waste source.
S/SS-5	Soil	Select Grid	Characterize waste source.
S/SS-6	Soil	Select Grid	Characterize waste source.
S/SS-7	Soil	Select Grid	Characterize waste source.
S/SS-8	Soil	Select Grid	Characterize waste source.
S/SS-9	Soil	Select Grid	Characterize waste source.
S/SS-10	Soil	Select Grid	Characterize waste source.
S/SS-11	Soil	Select Grid	Characterize waste source.
S/SS-12	Soil	Select Grid	Characterize waste source.
S/SS-13	Soil	Select Grid	Characterize waste source.
S/SS-14	Soil	Select Grid	Characterize waste source.
S/SS-15	Soil	Duplicate	Duplicate sample of S/SS-5

7.0 Figures (See Appendix A)

Figure 1 Regional Highway Map
Figure 2 Regional and Local Street Map
Figure 3 Site Topographic Map
Figure 4 Site Sketch and Locations of Anomalies
Figure 5 Monitoring Well and Surface Water Sample Location Sketch

8.0 Investigation-Derived Waste Plan

No investigation-derived waste will be generated at the TMRA site. All waste water from decontamination procedures will be disposed on the site premises and all cuttings from soil borings will be returned to their point of origin.

9.0 Project Management

Project Manager: Alex M. Cox
CLP: TBD
Safety Officer: TBD
Project Geologist: Alex M. Cox
Samplers: TBD

10.0 Field Equipment

See Appendix D for a list of the equipment that will be needed for sampling at the TMRA site. The sampling will be conducted according to Appendix C - Standard Operating Procedures for Field Operations.

11.0 Community Relations

MDE's Waste Management Administration (WAS) personnel have been coordinating sampling activities at the site with Dr. Patrick Herron, Personal Representative for MARVA Limited Partnership. Routine site-related activities will be handled by the WAS Project Manager. More complex issues will be addressed by ERRP management and/or the Eastern Shore Regional Manager.

12.0 References

1. Cecil County, Office of Taxation and Assessment, Internet site - http://www.dat.state.md.us.

2. ADC Map, Cecil County, Maryland - page 12.

3. Site Operations/Ownership History, Triumph Explosives, Inc. Elkton, Maryland. TechLaw, Inc. February 7, 1992.

4. Federal On-Scene Coordinators Report for Elkton Farm Site, USEPA-III, September 1992

5. Maryland Department of the Environment, Site Survey, April 2001.

6. NAEVA Geophysica, Inc. Results of Geophysical Investigation Former Triumph Explosives Facility, July 16-19, 2002

Appendix A

Figure 1 - Regional Highway Map

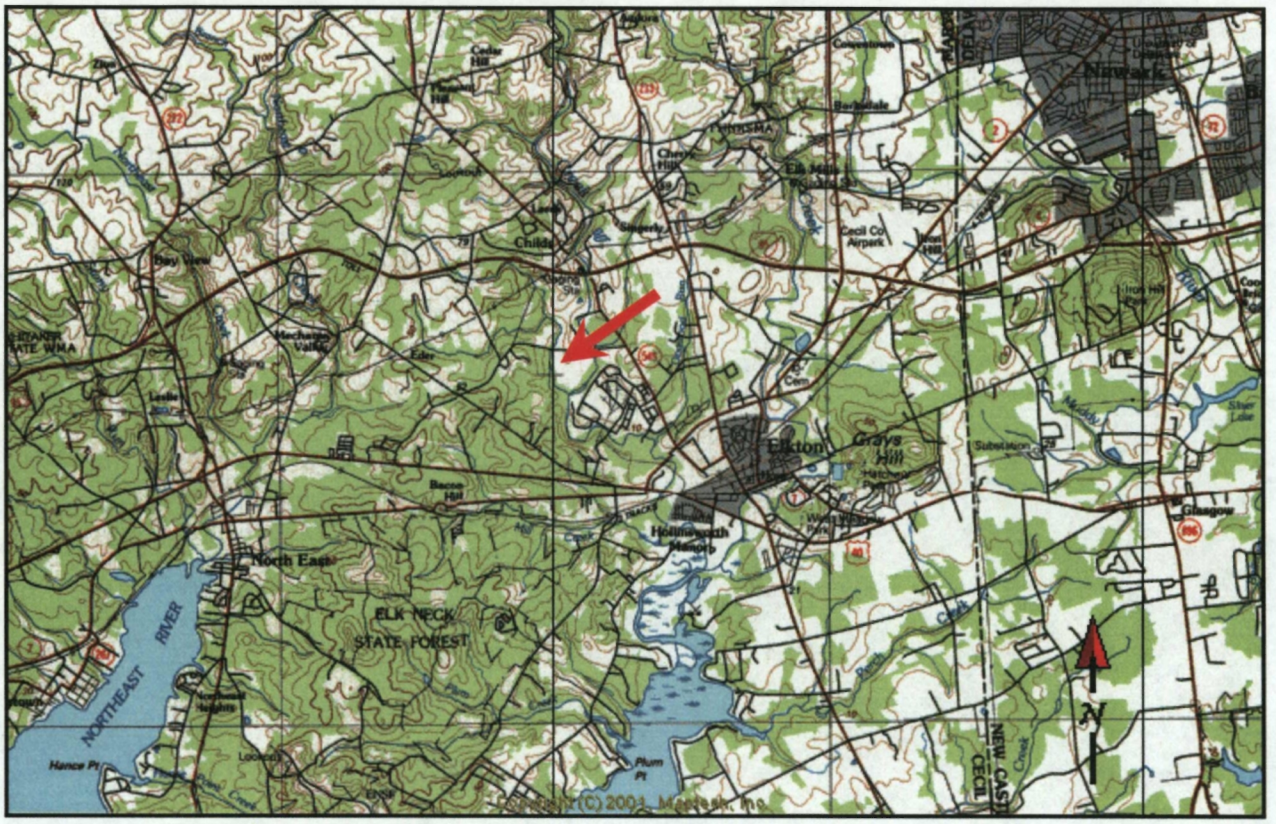


Figure 2 - Regional and Local Map

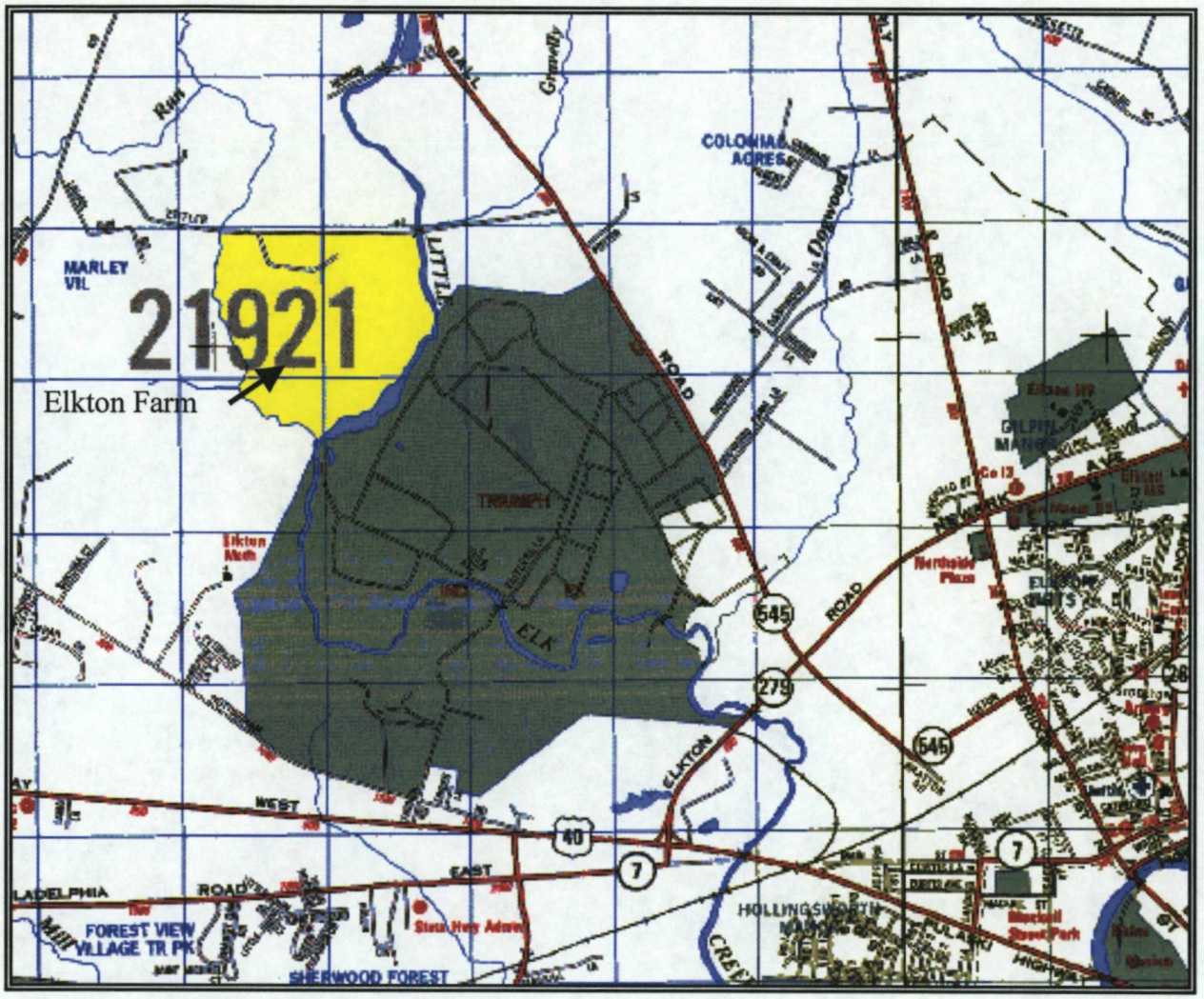


Figure 3 - Topographic Map

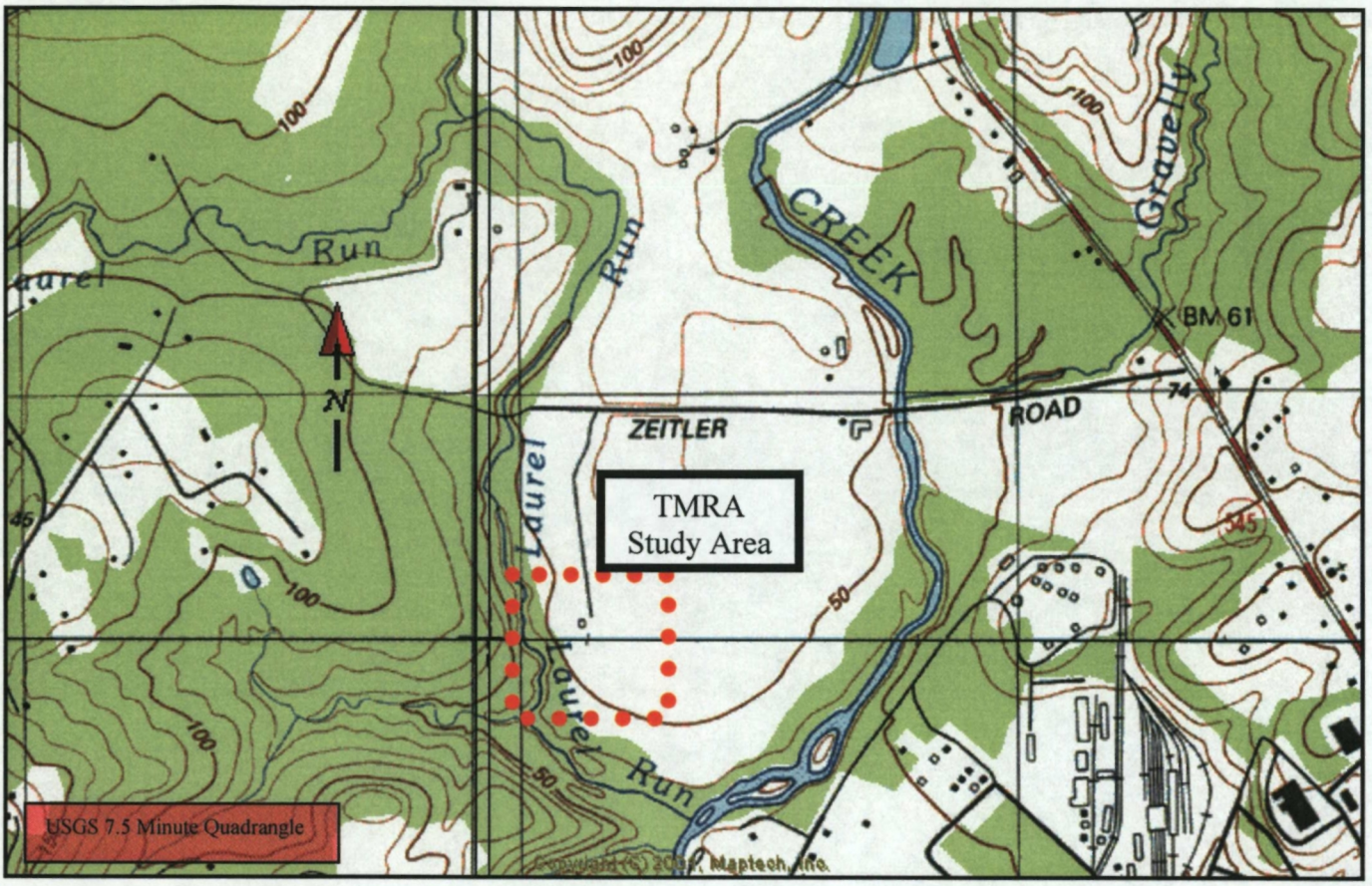


Figure 4 – Site Sketch and Locations of Site Anomalies

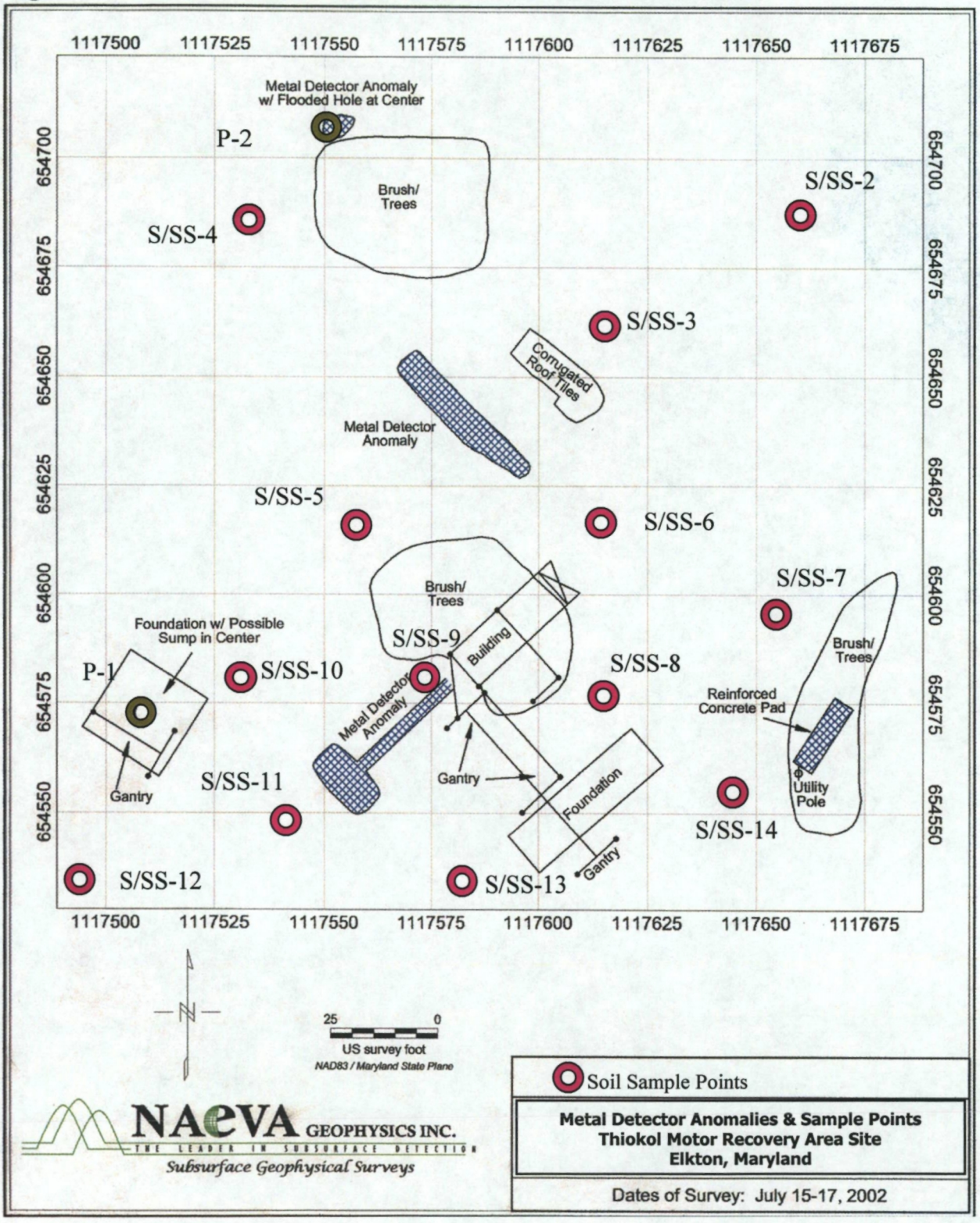
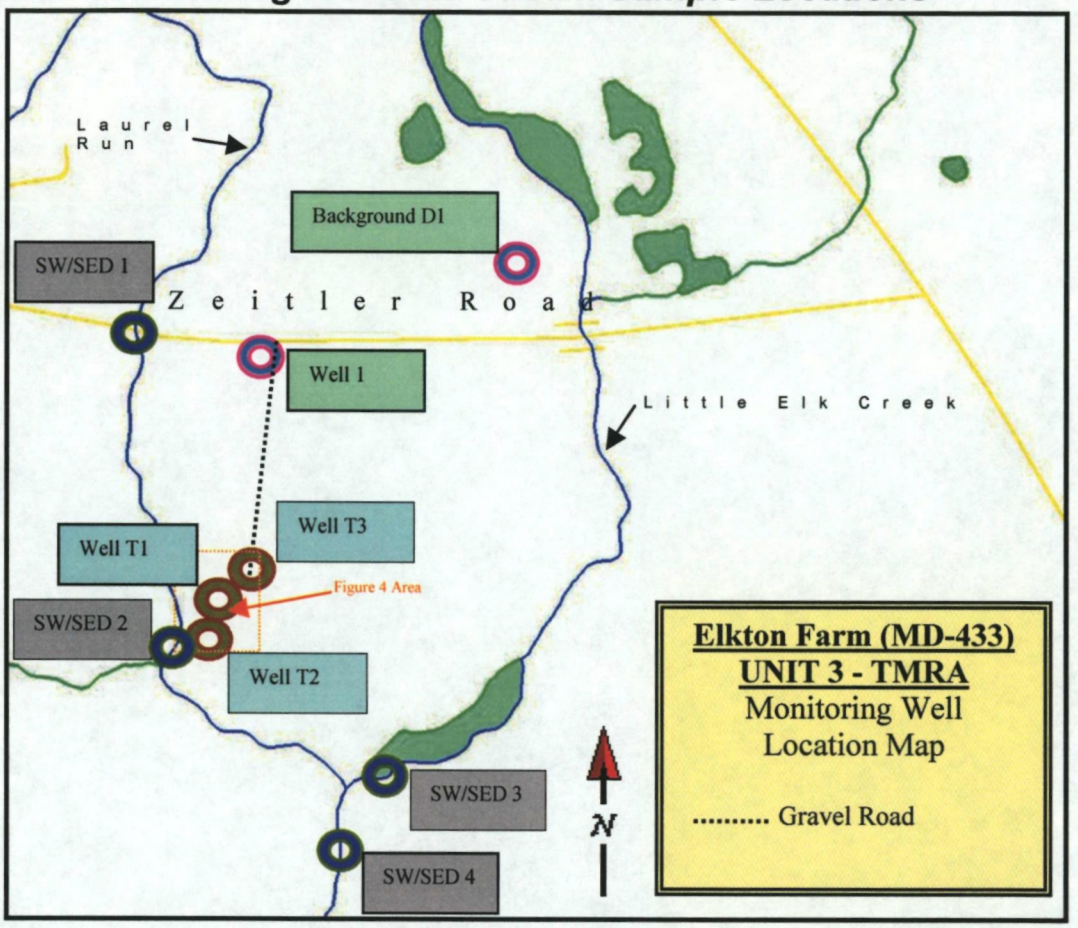


Figure 5 – Monitoring Well And Stream Sample Locations



Appendix B

SITE SAFETY PLAN

FOR

ELKTON FARM THIOKOL MOTOR RECOVERY AREA (MD-433)

PRELIMINARY ASSESSMENT/SITE INSPECTION

STATE OF MARYLAND

DEPARTMENT OF THE ENVIRONMENT

WASTE MANAGEMENT ADMINISTRATION

(MDE/WAS)

SITE & BROWNFIELDS ASSESSMENT/STATE SUPERFUND DIVISION

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1.0 SITE DESCRIPTION

1.1 SITE NAME AND ADDRESS:

Elkton Farm
183 Zeitler Road
Elkton, MD 21921

1.2 SITE NUMBER: MD-433

1.3 DATES PLANNED ON-SITE: April 2003

1.4 HAZARDS PRESENT OR SUSPECTED:

Nitro-aromatic Compounds, VOC's (TCE, carbon tetrachloride), PCBs, and metals in soil, sediment, and surface water.

1.5 TOTAL AREA OF SITE: 300-Acres

1.6 AREA BEING STUDIED: 1- Acre

1.7 SURROUNDING POPULATION: Industrial/Agricultural Residential

On-Site:	<10 Workers
0 - 1/4 Mile:	50 – 100 Workers
1/4 - 1/2 Mile:	to be calculated
1/2 - 1 Mile:	to be calculated

1.8 TOPOGRAPHY OF SITE:

The site is fairly level, sloping gently toward the adjacent streams.

1.9 WEATHER CONDITIONS AND FORECAST:

TBA

1.10 SITE ACCESS MAPS:

Topographic Map:	Refer to figure 1 of sampling plan
Site/Sampling Sketch:	Refer to figure 2 of sampling plan

2.0 ENTRY OBJECTIVES

The purpose(s) of this site entry are:

X to identify the suspected contamination of groundwater, surface water, sediment and soil in the vicinity of the site.

X to determine the degree of contamination of groundwater, surface water, sediment and soil in vicinity of the site.

The following number of samples will be collected:

32 Soil Samples
__ Soil Gas Samples
___ On-site Well Water Samples
__ Production Well Water Samples
4 Monitoring Well Water Samples
1 Residential Well Water Samples in the Vicinity
5 Surface Water Samples
5 Groundwater Samples (Geoprobe)
5 Sediment Samples
__ Air Samples
__ Container Samples
__ Leachate

3.0 ON-SITE ORGANIZATION AND COORDINATION

3.1 MDE-WAS CERCLA PRE-REMEDIAL DIVISION REPS:

Contact: Art O'Connell, Division Chief
1800 Washington Blvd., Suite 625
Baltimore, Maryland 21230
410-5371-3493

The following personnel are designated to carry out the stated job functions on-site. One person may carry out more than one job function. In case of absence of personnel, the alternative will be designated by the Project Manager and/or authorized personnel.

JOB FUNCTION	NAME	WORK PHONE
Project Manager	Alex M. Cox	410-5371-3493
Site Safety Officer	TBA	
Field Quality Assurance Officer	TBA	
Site Geologist	TBA	
Sampling Team	TBA	
Drilling Team	TBA	

3.2 OTHER STATE REPS:

AGENCY NAME PHONE

3.3 FEDERAL AGENCY REPS:

EPA

3.4 LOCAL AGENCY REPS:

3.5 OTHER REPS:

4.0 ON-SITE WORK PLAN

The following on-site tasks will be performed by the designated personnel: **TBD**

TASK	TEAM MEMBERS	
Decontamination Zone Setup		
Decontamination Team		
Grid System Setup		
On-Site Well Sampling		
Soil Sampling		

Soil Gas Survey		
Well Sampling		
Surface Water/Sediment		
Air Sampling		
Rescue Team		
Field GC Sampling Team		
Water Level Measuring/ Well Purging		

5.0 SITE CONTROL - WORK ZONES

The following personnel have been designated to coordinate access control and security on-site:

TBA

In order to prevent or reduce the migration of contaminants, controlled work zones and control points should be set up and marked. Work zones include the Exclusion Zone (hot zone), Contamination Reduction Zone (decon zone), and Support Zone (clean zone). No unauthorized person should be within these areas. Command Post (support zone) should be located upwind from the Exclusion Zone. The control boundaries and access control points into each zone will be marked and made known to all personnel during daily briefing. The work zone is sketched below:

* Sampling events at the Elkton Farm will be initiated in level "D" protective wear. The work zones as indicated above are not applicable for this phase of work to be completed.

6.0 SAFETY AND SPECIAL TRAINING REQUIRED

All personnel permitted in areas requiring personnel protective equipment and clothing (the hot zone and decontamination zone) must have, as a minimum requirement, attended EPA's Personnel Protection and Safety training course (165-2) or equivalent (165-5). A safety and task briefing meeting will be conducted each day before site entry. The safety procedures, evacuation procedures, escape procedures, as well as the day's planned activities will be discussed.

7.0 HAZARD EVALUATION

7.1 PRIMARY HAZARDS

The following substance(s) are known or suspected to be on-site. The primary hazards of each are identified as:

Perchlorates	(CAS)
Trinitrotoluene	(CAS 118-96-7)
Trichloroethene	(CAS 79-01-6)
Carbon Tetrachloride	(CAS 56-23-5)

8.0 PERSONNEL PROTECTION EQUIPMENT

8.1 TASK TEAM PROTECTION LEVEL

Based on evaluation of potential hazards, the following levels of personnel protection have been designated for each task team:

TASK TEAM	PROTECTION LEVEL (A,B,C,D, OTHER)
Decontamination Zone Setup	D
Grid System Setup	N/A
Well Sampling	D
Soil Gas Survey	N/A
Soil Sampling	D
Surface Water Sediment Sampling	D
Residential Well Sampling	D
Air Sampling	N/A
Container Sampling	N/A
Rescue Team	N/A
Decontamination Team	D
Drilling Team	N/A
Soil Boring Sampling/GC Analysis	N/A
Split Spoon Soil Sampling	N/A

8.2 SPECIFIC PROTECTIVE EQUIPMENT

Specific protective equipment for each protection level:

LEVEL A

Fully encapsulating chemical-resistant suit
Pressure-demand, self-contained breathing apparatus (SCBA)
Coveralls*
Long cotton underwear*
Gloves(inner), chemical resistant
Boots, chemical-resistant, steel toe and shank
Hard hat (under suit)*
Disposable gloves and boot covers* (worn over fully encapsulating suit)
Cooling unit*
2-way radio communications (inherently safe)
(*) OPTIONAL

LEVEL B

Pressure-demand, self-contained breathing apparatus (SCBA)
Chemical-resistant clothing (includes: overalls and long-sleeved jacket; hooded, one or two-piece chemical splash suit; disposable chemical-resistant, one-piece suits)
Long cotton underwear*
Coveralls*
Gloves (outer), chemical-resistant
Gloves (inner), chemical-resistant
Boots, chemical-resistant, steel toe and shank
Disposable boot covers, chemical-resistant*
Hard hat (face shield)*

2-way radio communications (inherently safe)*
(*) OPTIONAL

LEVEL C

Air-purifying respirator, full-face, canister-equipped
Chemical-resistant clothing (includes: coveralls; hooded one or two-piece chemical-resistant coveralls)
Coveralls*
Long cotton underwear*
Gloves (outer), chemical-resistant
Gloves (inner), chemical-resistant
Boots, chemical-resistant, steel toe and shank
Disposable boot covers, chemical-resistant*
Hard hat (face shield)*
Escape mask*
2-way radio communications (inherently safe)*
(*) OPTIONAL

LEVEL D

Coveralls
Gloves*
Boots/Shoes, leather or chemical-resistant, steel toe and shank
Safety glasses or chemical-splash goggles*
Hard hat (face shield)*
Disposable boot covers*
Escape mask*
(*) OPTIONAL

OTHERS

Level B or Level C can be modified to fit the actual situation when necessary upon approval from Safety Officer. If air-purifying respirators are selected, the appropriate cartridge for use corresponding to the involved substances and concentrations will be designated as:

SUBSTANCE	CARTRIDGE
Modified Level D:	
Respirator, organic/particulate cartridge	

No changes to the specified levels of protection shall be made without the approval of the safety officer and the project manager.

9.0 MONITORING

9.1 ENVIRONMENTAL MONITORING

The following environmental monitoring instruments shall be used on-site (circle when applicable) at the specified intervals.

INSTRUMENT	FREQUENCY
Combustible Gas Indicator	continuous/hourly/daily/other
Oxygen Monitor	continuous/hourly/daily/other
Draeger Tubes	continuous/hourly/daily/other
Metal Detector	continuous/hourly/daily/other
HNU/OVA	continuous/hourly/daily/other____ Microtip

*Microtip to be used on an as needed basis and for Soil samples.

Radiation Detector Equipment:

Mini Alert Monitor 4

Personal Radiation Monitor **BADGES**

Count Rate Meter Initial site entry/other

Geiger-Mueller Radiation

9.2 HEAT STRESS MONITORING

For monitoring the body's recuperative ability to handle excess heat, one or more of the following techniques should be used as a screening technique. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degrees Fahrenheit, workers must be monitored for heat stress after every work period.

Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33%.

Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees Fahrenheit at the beginning of the next rest period, the following work cycle should be further shortened by 33%. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degrees Fahrenheit.

Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5% of the total body weight. If it does, workers should be instructed to increase their daily intake of

fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the workday. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

10.0 COMMUNICATION PROCEDURES

10.1 EMERGENCY SIGNAL - LEAVE HOT ZONE

The following signal is the emergency signal to indicate that all personnel should leave the Exclusion Zone:

N/A

Is a loud hailer required (YES/NO): NO

10.2 HAND SIGNALS

The following standard hand signals will be used in case of radio communication failure:

HAND SIGNALS	INDICATIONS
Hand gripping throat	Out of air, can't breathe
Pat on partner's shoulders	Leave area immediately
Both hands around waist	Leave area immediately
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am alright, I understand
Thumbs down	No, negative

***Communication at Elkton Farm will be done primarily through verbal contact.**

10.3 LOCATION OF TELEPHONE

The location of on-site phone: mobile phone in sampling van.

The location of the nearest off-site phone (need to be mentioned during briefing): Corner of Elkton Blvd (Rt. 279) and Bridge Street.

11.0 DECONTAMINATION PROCEDURES:

Refer to Site Inspection Quality Assurance Project Plan.

12.0 EMERGENCY PLAN

12.1 EMERGENCY MEDICAL CARE FACILITY

Medical Facility:	Union Hospital Ctr
Address:	106 Bow St Elkton, MD 21921
Phone Number:	410-398-4000

Time Needed to Reach Facility: 9 minutes driving time.

Person Contacted: Administration

Directions to Hospital from site:

1. Start out going East on ZEITLER LN toward MD-545/BLUE BALL RD. -1.12 miles
2. Turn RIGHT onto MD-545/BLUE BALL RD. 1.27 miles
3. Turn LEFT onto MD-279/ELKTON RD. 0.58 miles
4. Turn RIGHT onto N BRIDGE ST/MD-213. 0.81 miles

5. Turn LEFT onto CATHEDRAL ST. 0.15 miles
Total Estimated Time: 9 minutes **Total Distance:** 3.93 miles

Designated place for medical facility access map Sampling Van:
Local ambulance available: Yes
Ambulance phone number: 911
Ambulance response time: Unknown
(Whenever possible, arrangements should be made for on-site standby.)

12.2 FIRST-AID EQUIPMENT ON-SITE

First-aid equipment is available on-site at the following locations:
First-Aid Kit: Sampling Van
Emergency Eye Wash: Sampling Van

12.3 EMERGENCY MEDICAL INFORMATION

Emergency medical information for substances present (from NIOSH Pocket Guide to Chemical Hazards):
SUBSTANCES EXPOSURE SYMPTOMS FIRST-AID INSTRUCTIONS

12.4 OTHER EMERGENCY PHONE LIST

List of Emergency Phone Numbers:

AGENCY/FACILITY	CONTACT	PHONE NUMBER
Police		911
Fire		911
Haz Mat Unit	MDE	410-633-4686
State Hazardous Material and Oil Response Unit	MDE	410-633-4686
Helicopter Ambulance		911

13.0 EMERGENCY PROCEDURES

The following standard emergency procedures will be used by on-site staff who are also responsible for ensuring that the appropriate procedures are followed.

13.1 Personnel Injury in Hot Zone.

Designated emergency signal:
Upon notification of an injury in the exclusion zone, the designated emergency signal shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the hot zone with proper level of protection to remove the injured person(s) to the decontamination zone. The Site Safety Officer and Project Manager should evaluate the nature of the injury, and the affected person(s) should be decontaminated to the extent possible prior to movement to the Support Zone. The Site Safety Officer shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symptoms are determined.

13.2 Personnel Injury in the Clean Zone.

Designated Emergency Signal:

Upon notification of an injury in the Support Zone, the Project Manager and Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue, with the Site Safety Officer initiating the appropriate first aid and necessary follow-up as stated above. If the injury increases the risk of others, the designated emergency signal shall be sounded and all site personnel shall move to the decontamination line for further instructions. Activities on-site will stop until the added risk is removed or minimized.

13.3 Fire or Explosion.

Designated Emergency Signal:

Upon notification of a fire or explosion on-site, the designated emergency signal shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

13.4 Personal Protective Equipment Failure.

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

13.5 Other Equipment Failure.

If any other equipment on-site fails to operate properly, the Project Manager and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on-site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken. Standby protective and monitoring equipment will be provided to ensure adequate protection in the event of equipment failure.

13.6 Alternate Escape Route from Hot Zone.

Figure X shows the designated emergency escape routes in the situations where egress from the Exclusion Zone cannot occur through the decontamination corridor.

13.7 Reentry after Emergency Evacuation.

In all situations, when an on-site emergency results in evacuating the Exclusion Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The Site Safety Plan has been reviewed.
4. Site personnel have been briefed on any changes in the Site Safety Plan.

EMERGENCY PROCEDURES SUMMARY:

* Designated work zones are not applicable during this phase of the SI, therefore emergency signals other than those indicated in section 10.2 have not been established. The primary means of communication on site will be through verbal contact.

SAFETY PLAN ACKNOWLEDGEMENT FORM

All site personnel and site visitors have read the above plan and are familiar with its provisions.

NAME	AGENCY	SIGNATURE

Appendix C

Standard Operating Procedures for Field Operations

Table of Contents

STANDARD OPERATING PROCEDURE FOR FIELD OPERATIONS

Physical Samples:

These operating procedures describe the standard methods utilized by the MD WMA for obtaining accurate and representative field samples from sites containing potentially hazardous materials/ wastes.

The purpose of these operating procedures are to assure quality control in field operations and provide uniformity in technician field techniques.

All equipment utilized for sampling purposes will be cleaned and calibrated prior to utilization. Calibrations will be done in accordance with the manufacturer's specifications. Contaminated sample equipment will be decontaminated prior to exit from the contamination reduction zone. (See Standard Operation Procedure for Field Decontamination.)

Any equipment that becomes inoperative in the field will be clearly marked as such and returned to proper technical personnel for repair or replacement.

Each site team will maintain a bound logbook detailing all information deemed pertinent to the investigation. Examples of pertinent information are as follows:

1. Date, times of arrivals and departure.
2. Project name and location.
3. Site personnel - team members and site coordinator.
4. Site operations to be carried out.
5. Accurate site sketch to include buildings, wells, tanks, surface waters, locations of sample points, etc.
6. List of samples - to include sample number, time of sample, sampler, sample location identifier.
7. Equipment field calibration results.
8. Observations pertinent to the description of the overall site.
9. Weather conditions/site conditions.

STANDARD OPERATING PROCEDURE FOR DETERMINING LEVELS OF PROTECTION DURING SITE SAMPLING

This procedure describes the MD WMA standard method for determination of levels of protection to be utilized in site sampling operations.

The purpose of this procedure is to ensure the health and safety of the site sampling team.

This procedure identifies the four standard levels of personnel protection that may be used by MD WMA personnel during any site investigation. This procedure is extracted from the EPA-OERR-Hazardous Response Support Division's document "Standard Operating Safety Guides" published by USEPA 10/84.

1. Level D Protection

a. Level D Protection is the lowest level of protection to be utilized. Level D Protection consists of coverall (or long-sleeved shirt and pants) steel-toed boots and hard hat.

b. This level is utilized in areas where there is no possibility of contact with environmental contaminants.

2. Level C Protection

a. Level C Protection consists of a chemical resistant coverall, full face air purifying respirator, two layers of chemical resistant gloves, two layers of protective boots, hard hat, face shield, and duct tape to seal gloves, boot and coverall joints.

b. Level C Protection should be used when the type and concentration of airborne contaminants is known or can be measured, and the oxygen concentrations are greater than 19.5%. Level C should not be used where there is a possibility of direct skin contact with materials.

3. Level B Protection

a. Level B Protection consists of a pressure demand self-contained breathing apparatus (SCBA), chemical resistant "Saranex Tyvek" coverall with hood, two layers of chemical resistant gloves, two layers of protective boots, hard hat, and duct tape for sealing openings.

b. Level B Protection shall be utilized when any of the following criteria are met:

1. The type and concentration of toxic substances have been identified and require a high degree of respiratory protection, however, contaminant contact with the skin is not a primary concern.

2. There is a possibility that the oxygen concentration in the work area is below 19.5%.

3. Real time organic vapor meter (PID) measurement indicates "action" levels of unidentified vapors, however, vapors are not suspected of containing high levels of chemicals toxic to the skin.

4. Work being done on-site will not generate continuous high levels of contaminant vapors, gases, or particulates (>500 ppm) nor will it generate splashes of material that could affect the skin of site personnel.

4. Level A Protection

a. Level A Protection consists of a pressure demand self-contained breathing apparatus (SCBA), fully encapsulating chemical-resistant suit, coverall, two layers of chemical resistant gloves, two layers of protective boots, hard hat (under suit).

b. Level A Protection shall be utilized when any of the following criteria are met:

1. The chemical substance has been identified and requires the highest level of protection for the skin, eyes, and respiratory system.

2. Acutely hazardous substances are known or suspected to be present and skin contact might be possible.

3. Real time vapor measurements indicate continuous high levels of unidentified substances (i.e. >500 ppm).

STANDARD OPERATING PROCEDURES FOR PREPARATION OF FIELD BLANKS AND DUPLICATES

This operating procedure describes the MD WMA standard method for preparing field blanks and duplicates.

The purpose of this operating procedure is to assure uniformity in field techniques and to serve as an indicator of sample contamination throughout the entire sampling and analysis process.

The following equipment is to be utilized for preparation of field blanks and duplicates: sample containers, label tape, waterproof marker, deionized distilled water.

Procedures to be followed for preparing field blanks and duplicates are:

Obtain the necessary approved sample containers.

Trip Blanks:

1. One working day prior to performing on-site sampling, submit 40 ml VOCs (a minimum of one trip blank - 2 vials - per day per site inspection) to the Division of Environmental Chemistry (MD DHMH, Labs Administration) for preparation of trip blanks. The Laboratory will fill the containers with distilled, deionized, contaminant-free water, which it has prepared. (This water was prepared by being passed through a filtration and finally reverse osmosis water purification unit. The water is then distilled daily to drive off any trace volatiles.) These trip blanks will be issued through chain of custody in the Laboratory to the field sampler.

   Alternatively, the trip blanks may be prepared by the Field Quality Control Manager or Site Project Manager.

2. Preserve the sample with hydrochloric acid to pH less than 2, and store in an insulated container with ice to a temperature less than 4° C.

3. Label and tag the containers as a trip blank sample and record all pertinent information in the field logbook.

4. Transport and store these trip blanks in the same manner as the site inspection samples but do not open them.

5. Maintain and document trip blank possession according to the Chain of Custody procedures in Section VI of the Quality Assurance Project Plan.

6. Submit the trip blanks with the site inspection samples to the appropriate laboratory for VOA analyses.

Field Blanks:

1. One working day prior to performing on-site sampling, obtain distilled, deionized, contaminant-free water from the Division of Environmental Chemistry (MD DHMH, Labs Administration). The water is stored in appropriate containers (currently 5-gallon carboys are used). Record all information concerning the water in the field logbook.
2. Transport and store this water in a manner to avoid contamination (e.g. away from fuel, preservatives, etc.). Currently, the carboys are stored in the Site Assessment Division Sampling Van, which remains locked.
3. Once in the field, fill one of each type of sample container for each type of matrix with the distilled, deionized, contaminant-free water from the Laboratory. If appropriate, add the required preservatives to the container.
4. Label the containers to identify them as field blank samples and record all pertinent information in the field logbook.
5. Store and transport these field blanks in the same manner as the site inspection samples.
6. Maintain and document field blank possession according to the Chain of Custody procedures in Section VI of the Quality Assurance Project Plan.
7. Submit the field blanks with the site inspection samples to the appropriate laboratory for analyses required by the site sampling plan.

Duplicate Samples:

1. Duplicate samples will be collected at a frequency of one duplicate per 20 samples per matrix. Samples for duplicate analysis will be specified in the site-sampling plan.
2. Once the sample for duplication is determined, collect the sample according to the appropriate Standard Operating Procedure, splitting the sample matrix between two like container types. The duplicate sample must be collected from exactly the same location with the same collection apparatus as the actual sample. (For example, a scoop of soil should be equally split between two identical 8-ounce glass jars.) A duplicate sample should be collected using each container type and appropriate preservatives.
3. The duplicate samples should be labeled as any other sample so as not to bias the Laboratory's analysis. Record all pertinent information in the field logbook.
4. Store and transport these duplicate samples in the same manner as the site inspection samples.
5. Maintain and document duplicate sample possession according to the Chain of Custody procedures in Section VI of the Quality Assurance Project Plan.
6. Submit the duplicate samples with the site inspection samples to the appropriate laboratory for analyses required by the site-sampling plan.

STANDARD OPERATING PROCEDURE FOR SOIL SAMPLING

This operating procedure describes the MD WMA standard method for the collection of representative samples of soils for physical and chemical analysis from a potential hazardous waste site.

The purpose of this operating procedure is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

All equipment utilized in these methods must be adequately decontaminated prior to samples being taken.

Surface Soils Sampling Method:

The following equipment is to be utilized for obtaining surface soil samples: surveyor flags or stakes, stainless-steel sample trowel, stainless-steel scoops, stainless-steel bucket, sample containers with labels, waterproof markers, organic vapor meter, decontamination equipment.

Procedures for obtaining a representative surface soil sample are as follows:

1. Locate sample points as identified in the sampling plan for the individual site study.
2. Prepare sample containers according to the needs of the study. Refer to Section V, Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document for proper sample containers, preservatives and holding times.
3. Stake out a three-feet square over each sample point. Care must be taken in this procedure so as not to contaminate the surface by stepping in the delineated area.
4. Take a one-inch deep, six-inch square sample from each of the four corners and the center of the square.
5. Composite these samples by mixing soil with a stainless-steel trowel in the stainless-steel bucket. (Be careful to avoid vegetative material and larger gravels.) Composite samples should be monitored with the organic vapor meter to determine if organic constituents may be present.
6. Place homogenized composite soils in sample containers. Discrete samples should be taken for volatile organic analyses.
7. Record all pertinent information in the logbook. Pertinent information should include: site sketch, date, time, technicians, sample types, sample locations, description of site, weather conditions, soil type and consistency.
8. After samples have been obtained, the exterior of the sample containers should be rinsed with distilled water and dried with a clean cotton wiping cloth.
9. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI, of the Quality Assurance Project Plan.

Subsurface Soil Sampling Method:

The following equipment is to be utilized for obtaining subsurface soil samples: surveyors' flags or stakes, stainless-steel or chrome plated hand auger, stainless-steel bucket, stainless-steel trowel, stainless-steel scoops, 3'x3' plastic sheets, sample containers with labels, waterproof markers, organic vapor meter, decontamination equipment.

Procedures for obtaining representative subsurface soil samples are as follows:

1. Locate sample points as identified in the site specific sampling plan.
2. Determine sample depth intervals from the sampling plan.
3. Prepare sample containers according to the needs of the study. Refer to Section V, Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document for proper sample containers, preservatives and holding times.
4. Carefully advance the auger through the soils removing each auger of soil and reserving soil on plastic sheeting placed downgradient of the auger hole.
5. Monitor organic emissions from the borehole utilizing the organic vapor meter and record any readings and at depths encountered in the logbook.
6. Prior to sampling the strata of interest, decontaminate the auger. (See Standard Operating Procedure for Field Decontamination.)
7. Subsurface samples are to be obtained as per the site-sampling plan and at any other depths where contamination is encountered.
8. Record depths to the nearest foot of obvious contamination zones and make note of any changes in soil character and moisture content.
9. Following completion of auguring, decontaminate the auger. (See Standard Operating Procedure for Field Decontamination.)
10. If composited samples are required, composite in stainless steel bucket and transfer to sample containers as described in items 5-7 of aforementioned surface soil sampling method.
11. The exterior of the sample container should be rinsed with distilled water and dried with a clean wiping cloth after the sample has been obtained.
12. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.

Soils Sampling Using Geoprobe Direct Push Procedure:

The following equipment is to be utilized for obtaining soil samples at Geoprobe soil sample locations: surveyor flags or stakes, stainless-steel sample trowel, stainless-steel scoops, stainless-steel bucket, core tube inserts, sample containers with labels, waterproof markers, organic vapor meter, decontamination equipment.

Procedures for obtaining representative surface and subsurface soil samples using a Geoprobe core are as follows:

1. Locate sample points as identified in the sampling plan for the individual site study.
2. Determine sample depth intervals from the sampling plan.
3. Prepare sample containers according to the needs of the study. Refer to Section V, Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document for proper sample containers, preservatives and holding times.
4. Set up on station. Advance Geoprobe core to desired depth collecting individual four-foot sections of core; label each core section with depth, time and collector. Move within designated sample area and repeat as necessary. Subsurface samples are to be obtained as per the site-sampling plan and at any other depths where contamination is encountered.
5. Take two or more one-foot sections of each desired sample depth. (Surface = 0 – 1 foot deep. Subsurface = 3 – 4 foot deep.)
6. Composite these samples by mixing soil with a stainless-steel trowel in the stainless-steel bucket. (Be careful to avoid vegetative material and larger gravels.) Composite samples should be monitored with the organic vapor meter to determine if organic constituents may be present. (Note: If organic constituents are a contaminant of concern then VOC sample should be collected immediately from the one-foot core prior to compositing.)
7. Place homogenized composite soils in sample containers. Discrete samples should be taken for volatile organic analyses.
8. Record all pertinent information in the logbook. Pertinent information should include: site sketch, date, time, technicians, sample types, sample locations, description of site, weather conditions, soil type and consistency. Note soil horizons and estimate soil characteristics for each core section down to desired depth.
9. Record depths to the nearest foot of obvious contamination zones and make note of any changes in soil character and moisture content.
10. After samples have been obtained, the exterior of the sample containers should be rinsed with distilled water and dried with a clean cotton wiping cloth.
11. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI, of the Quality Assurance Project Plan.
12. Decontaminate all sample equipment with a mixture of Alconox and water. Rinse three times with distilled water and dry before moving to next sample location.
13. Following completion of boring, decontaminate the Geoprobe core tubes. (See Standard Operating Procedure for Field Decontamination.)

STANDARD OPERATING PROCEDURES FOR FIELD SCREENING SOIL SAMPLES

This operating procedure describes the MD WMA standard method for collection and field screening samples for the presence of metals, polychlorinated biphenyl (PCB), carcinogenic polyaromatic hydrocarbons (cPAH), semi-volatile organic compounds (SVOC), and total petroleum hydrocarbons (TPH).

The purpose of this operating procedure is to assure uniformity in field techniques and to serve as an aide in delineating samples for submission to a fixed laboratory. A secondary purpose of field screening is to provide additional data to be used in defining extent of contamination at a site.

Procedures to be followed for field screening soil samples:

Obtain the necessary approved sample containers.

1. Collect Field Screening samples at all proposed sample locations.

2. Label and tag the containers as Field Screening samples and record all pertinent information in the field logbook.

3. Transport samples to Field Lab for field screening procedures

4. Screen all soil samples for concentrations of carcinogenic PAHs, PCBs and BTEX/TPHs using Strategic Diagnostics, Inc. (SDI) immunoassay test kits on a SDI RaPID Photometric Analyzer and X-ray Fluorescence (XRF).

5. Screen all soil samples for metals using Spectrace QuanX Analyzer System with an electronically cooled detector.

6. Review results of field screening to determine trends or anomalies in site data. Define which samples will be submitted for fixed laboratory confirmation.

7. Follow SOP for sample collection and submission to fixed laboratory using all recommended sample containers, holding times, and collection, storage and shipping procedures.

STANDARD OPERATING PROCEDURE FOR SURFACE WATER SAMPLING

This operating procedure describes the MD WMA standard method for the collection of a representative sample of surface waters in free flowing and/or open water bodies.

The purpose of this operating procedure is to assure quality control in field operations and to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

The following equipment is to be utilized for obtaining surface water samples: appropriate sample containers as detailed in the site sampling plan, label tape, distilled water, clean lint-free cotton wiping cloths, waterproof marking pens, bucket.

Procedures for obtaining a representative surface water sample are as follows:

1. Sampling is to begin at the furthest downstream point identified in the site-sampling plan.
2. Open container and fill, moving container in an upstream direction. Avoid strong agitation of the waters.
3. Fix samples as required and in accordance with the site sampling plan. Refer to Section V, Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document for proper sample containers, preservatives, and holding times.
4. Close container, rinse with distilled water and dry with cloth.
5. Label container to identify sample station as outlined in the site-sampling plan.
6. Obtain a bucket of water. Perform pH and specific conductance checks according to Standard Operating Procedure for Use and Calibration of pH and Specific Conductance Meters.
7. Record all pertinent field information in logbook (to include any in-situ measurements).
8. Samples are to be packed in ice and placed in cooler pending delivery to laboratory. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.
9. Proceed to next upstream station and repeat procedure.

STANDARD OPERATING PROCEDURE FOR SUBAQUEOUS SEDIMENT SAMPLING

This operating procedure describes the MD WMA's standard method for obtaining samples of sediments from subaqueous deposits.

The purpose of this operating procedure is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

The following equipment is to be utilized for obtaining sediment samples: stainless-steel scoop, stainless-steel bucket, sample containers, label tape and waterproof markers.

Procedures for obtaining samples of subaqueous sediments are as follows:

1. Proceed to the farthest downstream sample location as determined in the site sampling plan. (In a free-flowing stream, samples should be obtained from pooled areas where settling of particulates will have occurred.)
2. Move the scoop in an upstream direction to obtain sample.
3. Transfer sample directly into sample containers. Refer to Section V, Laboratory and field Integration, Appendix A, Hazardous Waste Laboratory Quality Assurance Document for proper sample containers, preservatives and holding times.
4. Allow fine materials to settle in the container and then decant liquid off top of sample as necessary, being careful to retain fine sediments.
5. Secure sample container and label properly.
6. Clean exterior of containers with distilled water and pack for transport to laboratory.
7. Proceed to the next upstream station and repeat steps until uppermost station has been completed.
8. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.

STANDARD OPERATING PROCEDURE FOR OBTAINING SAMPLES OF DRUMMED LIQUID MATERIALS

This operating procedure describes the standard method utilized by MD WMA to obtain samples from drummed liquid material.

The purpose of this operating procedure is to assure uniformity in technician field techniques during site investigations.

The following equipment is to be utilized for obtaining samples from drummed material: non-sparking bung wrench, non-sparking chisel, non-sparking hammer, organic vapor meter (PID or equivalent), hydrion paper for determining pH, sample containers, label tape, waterproof marking pen, 10 mm glass drum, thief or glass coliwasa, absorbent pads, cotton cloth, plastic bag, personnel protective equipment as per guidelines.

Determine proper personnel protection required for the individual circumstance. Sampling is to be accomplished with a minimum of a three-technician team: at least two entry technicians and one back-up technician. Prior to any activities, the drum should be scanned with the organic vapor meter to determine if any vapors are being emitted. Condition of drum and all identifying marks should be noted and recorded in the field logbook. The following procedures should be followed in sampling:

1. Clean top of drum with cloth.
2. Place organic vapor meter near large bunghole of drum.
3. Carefully remove large bung allowing for pressure equalization. Place an additional absorbent pad next to bunghole.
4. Measure and record any organic vapor meter readings.
5. Using hydrion paper, measure and record the pH of material in drum.
6. Insert drum thief/coliwasa through bunghole to bottom of drum. Remove thief/coliwasa carefully checking liquid for stratification, color, etc. Place liquid in appropriate sample container. (Refer to Section V Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document, for proper sample containers, preservatives and holding times.) Repeat as necessary to fill all containers, being careful not to spill any material. Samples should be placed in whirl packs.
7. Wipe off sample thief and top of drum to remove any residue of sample. Discard thief/coliwasa, all wiping cloths, and absorbent pads into plastic bag. Dispose in accordance with Federal/State Regulations.
8. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.

STANDARD OPERATING PROCEDURE FOR GROUNDWATER MONITORING WELL SAMPLING

This operating procedure describes the MD WMA standard method for the collection of representative samples of groundwater from nonpotable monitoring wells.

The purpose of this operating procedure is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

The following equipment is to be utilized for obtaining groundwater monitoring well samples: weighted tape measure, organic vapor meter, flashlight and/or mirror, teflon bailer(s), dedicated or disposable bailer line, decontamination equipment, purge device (bailer, submersible pump, bladder pump, etc.), 5-gallon bucket, sample containers, label tape, waterproof marker, filtering equipment (See Standard Operating Procedure for Filtering Groundwater for Metals Analysis), pH meter, and specific conductance meter.

Procedures for obtaining representative groundwater samples are as follows:

A. Preliminary Inspection Phase

1. Inspect the condition of the monitoring well and record all pertinent information in the field logbook. This information includes: well ID number, the casing height above ground, soundness of protective casing, and effectiveness of surface grout seal.
2. Position the organic vapor meter near the well cap so as to measure any organic vapors emanating from the well and to evaluate the safety level.
3. Remove well cap and note organic vapor meter response. Record readings in logbook.
4. Use flashlight and/or mirror to inspect the interior of the well. Record all observations in the logbook.
5. Measure the depth to the water's surface from the top of the casing using the weighted tape measure. Record this depth to the nearest one-hundredth of a foot.
6. Measure the depth to the bottom of the well from the top of the casing using the weighted tape measure. Record this depth to the nearest one-hundredth of a foot.

B. Evacuation Phase

1. Using the following formula, calculate the total gallons of water required to evacuate three well volumes of water from the monitoring well.
   Depth to Bottom of Well Minus (-) Depth to Water Times (x) Well Diameter Factor Equals (=) Number of Gallons Which Should be Evacuated.
   Well diameter Factor (3 well volumes)

Well Diameter (inches)	Gallons/Foot of Water
2	0.5
3	1
4	2
6	4.5

(e.g. a four inch diameter well, 60 feet total depth with water level at 35 feet would have 25 feet of standing water and would require 50 gallons (25 x 2 gallons/foot) be purged before a sample could be collected.)

2. To purge the standing water, the pump needs to be set at a position between the water surface and five feet above the well screen. Once the water within the casing is purged, the pump should be lowered just above the well screen to withdraw groundwater from the aquifer. Measure the total amount of water discharged using a five gallon bucket and continue to pump and measure until the desired amount of water has been purged from the well.
3. When using a bailer to purge the monitoring well, measure the amount of water withdrawn from the well using a five-gallon bucket until the desired volume of water is purged from the well.
4. If the well purges dry and does not recharge in a reasonable amount of time, bail or pump dry again to withdraw at least two well volumes before sampling the well after recharge has occurred, which may require sample collection on the following day.
5. If purged groundwater is known or suspected to possess hazardous characteristics or contaminants, the purged water must be collected for storage and proper disposal. (Otherwise, purged water must be discharged at least 25 feet downgradient of the well.)

C. Sampling Phase

1. Remove a bail of water from the well and measure the pH and specific conductance. Record time, temperature, pH and specific conductance in field log book.
2. Carefully lower the teflon bailer into the well so as not to disturb the water. Gently lift the bailer and fill the sample bottles as required by the site-sampling plan in the following order:
   a. (2) 40 ml glass VOCs;
   b. Amber glass liter extractable jars (organic extractables);
   c. Amber glass gallon jugs (pesticides);
   d. Liter cubitainer (metals);
   e. Glass liter jars (oil and grease);
   f. Glass 8 ounce jars (spare for PCBs).

   Fix samples as required in Section V, Laboratory and Field Integration, Appendix A, Hazardous Waste Laboratory Quality Assurance Document.
3. Filter samples for metals analysis according to Standard Operating Procedure.
4. Thoroughly decontaminate all equipment and properly dispose of all contaminated materials. (See Standard Operating Procedure for Field Decontamination.)
5. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.

STANDARD OPERATING PROCEDURE FOR FILTERING GROUNDWATER FOR METALS ANALYSIS

This operating procedure describes the MD WMA standard method for filtering groundwater obtained from monitoring wells for analysis of dissolved metal concentrations.

The purpose of this operating procedure is to assure uniformity in field techniques so as to obtain accurate and reproducible data.

The following equipment is to be utilized for filtering groundwater: sample containers, label tape, waterproof marker, vacuum pump, plastic tubing, filter assembly, 0.45 um micropore filters.

Procedures for filtering groundwater are as follows:

1. After filling all other required sample containers at the well sampling location, collect a one-liter sample of water in a polyethylene container without preservation.
2. Assemble the filtration apparatus, using surgical gloves and tweezers to place a 0.45 um micropore filter on the lower filter assembly so that it lays flat on the unit. Carefully connect the upper and lower units of the filter assembly.
3. Connect the pump, tubing, and filter assembly. Operate the pump to create a vacuum on the system to draw water from the sample bottle through the assembly into a clean poly bottle. If the filter becomes clogged, release the vacuum, replace the filter, and then resume filtering as before.
4. Once the entire 1-L volume of water collected at the sample location has been filtered, then preserve the filtered water. Add concentrated nitric acid to the filtered water until the pH is less than 2, and record the amount of acid required.
5. Disconnect the filter assembly. Dispose of the used filter and rinse the entire assembly with dilute nitric acid solution. This includes running approximately 20 - 30 ml of dilute acid through the tubing using the pump vacuum. Follow this with at least two rinses of DI water, including running about 100 ml of DI water though the tubing.
6. Record all pertinent information in the field logbook.
7. Maintain and document sample possession according to the Chain of Custody procedures in Section VI of the Quality Assurance Project Plan.

STANDARD OPERATING PROCEDURE FOR RESIDENTIAL WELL SAMPLING

This operating procedure describes the MD WMA standard method for the collection of representative samples of groundwater from residential potable-water wells.

The purpose of this operating procedure is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

The following equipment is to be utilized for obtaining residential well samples: sample containers, label tape, waterproof marker, pH meter, specific conductance meter.

Procedures for obtaining a representative residential well sample are as follows:

1. Select residential wells for sampling according to the site-sampling plan.
2. Obtain as much information about the well and the plumbing system as possible from the homeowner and from observation. This information could include: location, well tag number, age of the well, construction of the well, depth of the well, well driller, well completion report, location of possible sources of contamination (septic systems, fuel tanks, barn yards, etc), location of other wells, type of plumbing in the house, location of water treatment devices, history of taste and/or odor problems, etc. Record all of this information in the field logbook.
3. Select a faucet for sampling as close to the water well outlet as possible. If the water system utilizes any water treatment devices, these should be bypassed while collecting the sample.
4. Utilizing the cold water line, purge the water line of standing water by letting the water run for at least 10 - 20 minutes, depending upon the amount of water used by the resident prior to the sampling visit, depth of the well, and distance from the house.
5. Following purge time, remove any aerators from the faucet and decrease the water flow to reduce turbulence while collecting the samples.
6. Collect a sample, which can be used to determine field parameters for pH, specific conductance, and temperature. Obtain pH and specific conductance readings according to Standard Operating Procedure. Record this information, as well as purge time, in the field logbook.
7. Collect the samples and add preservatives as required by the site-sampling plan. Refer to Section V, Laboratory and Field Integration, Appendix A, Division of Environmental Chemistry (MD DHMH, Labs Administration) Quality Assurance Document for information regarding sample containers and preservatives.
8. Turn off the water and return the residence's water system to its original state.
9. Maintain and document sample possession according to the Chain of Custody Procedures in Section VI of the Quality Assurance Project Plan.

STANDARD OPERATING PROCEDURE FOR ORGANIC VAPOR METER FIELD CALIBRATION AND USE

This operating procedure describes the MD WMA standard method for real time measurements of volatile airborne contaminants. This procedure specifically addresses photoionization detection methods utilizing the HNu Systems, Inc. Model PL 101 Photoionization Analyzer.

The purpose of this operating procedure is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

Bench calibration and checkout of the instrument should be performed one day prior to each field sampling program. Field calibration should be performed minimally at the beginning, middle and end of each working day. Any anomalies encountered in the field should be noted and the instrument should be returned to the proper technicians so that repair and recalibration can occur. All calibration and repair procedures are to be carried out in accordance with the manufacturer's specifications and recommendations.

Bench Calibration Procedures: (HNu Model PL 101 Photoionization Analyzer)

1. With the function switch in the "Off" position, attach probe to the meter.
2. Rotate function switch clockwise to the "Battery Check" position. The needle on the meter dial should be within the Green Bar region of the dial. If the needle is not in that region, meter indicates insufficient charge and recharge of battery for a minimum of eight hours is required.
3. Rotate function switch for "Standby". Zero the dial readout using the zero potentiometer knob on the right side of the meter.
4. Connect probe to container of span gas and set the function switch on the 0-200 ppm scale. "Crack" valve on span gas and note reading. Adjust the span potentiometer control so that the instrument read out registers the exact value of the span gas.
5. Note all procedures, repairs and calibrations in the instrument log book.
6. Attach label to meter indicating: (l) date of calibration, (2) span setting, (3) calibration gas range, and (4) technician's initials.

Field Calibration Procedures:

1. With function switch in the "Off" position, attach probe to the meter.
2. Rotate function switch clockwise to the "Battery Check" position. Needle should be well within the Green Bar area on the face plate for use.
3. Rotate switch to "On" position. Very briefly, observe the end of the probe to check that the UV light is on (i.e. purple glow). If light is not visible, check probe connections.
4. Rotate function switch to the "Standby" position and adjust zero potentiometer knobs to achieve zero on meter face. Wait 15-20 seconds to ensure that the zero reading is stable. (Repeat this step every time power is turned on or when span potentiometer has been adjusted.)

. To measure volatile organic emissions, rotate function switch to the most sensitive scale (0-20). Note the range setting, span potentiometer setting, instrument reading, and time in field log book. If the needle moves off scale, rotate function switch to next scale.

6. Avoid probe contact with liquid and solid surfaces. Water vapor may cause fogging of lamp resulting in incorrect readings and volatile contamination of the probe will result in erroneous readings. Clogging of the probe with soils or other materials will also result in erroneous readings or malfunctions. Always allow meter to reach temperature stabilization before making any readings.

STANDARD OPERATING PROCEDURE FOR USE AND CALIBRATION OF pH AND SPECIFIC CONDUCTANCE METERS

These procedures describe the MD WMA standard methods for field calibration of equipment that may be used for field identification of samples.

The purpose of these operating procedures is to assure uniformity in technician field techniques so as to obtain accurate and reproducible data.

pH Meter: Orion Model 401

The pH meter shall be calibrated, at a minimum, immediately prior to, and immediately after, the sampling run. All information is to be recorded in the field log book.

Calibration procedures:

1. Turn on power and allow instrument to stabilize for three to five minutes. Remove protective cap on pH probe.
2. Rinse pH probe with distilled water and dry with a clean kimwipe.
3. Determine if the pH range will be in the acidic or alkaline range. Select the proper standard buffer solutions to calibrate for expected pH range (7 and 4 for acid, 7 and 10 for base).
4. Using two dry and clean plastic cups, fill with enough buffer solutions to cover electrode.
5. Place pH probe in the 7 buffer. Gently swirl cup. When readout stabilizes, adjust to 7.00 with the span potentiometer knob.
6. Remove probe from buffer solution and rise with distilled water. Dry probe.
7. Place probe in the pH 10 buffer. Gently swirl cup. When the readout stabilizes, adjust the proper pH reading with the calibration dial.
8. Rinse and dry probe and recheck with pH 7 buffer.
9. Record all information in field logbook.
10. Calibration procedure shall be deemed necessary:
    a. Every time the instrument is turned on;
    b. When erratic behavior has been noted;
    c. When the pH range is outside the original limits of the study (e.g. acidic instead of basic or basic instead of acidic); or
    d. When there is a significant change in environment (e.g. movement from protected area to outside or movement from shade to direct sunlight).
11. Any problems encountered with pH measurement equipment shall be reported to the proper technician for correction.
12. Field measurement of pH:
    a. Place enough sample in plastic cup to cover electrode.
    b. Remove protective caps on probe and rinse thoroughly with distilled water and dry.
    c. Place probe in sample and gently swirl cup.
    d. When readout stabilizes, record indicated pH in field logbook.
13. After field measurements have been completed, rinse probe with distilled water and replace protective cap. Discard sample and container and used buffer solutions and containers.

Specific Conductance Meter: YSI Model 33

Field calibration for the Salinity Conductivity Temperature (SCT) meter is an internal calibration. The procedures for set up and sample measurements are as follows:

1. Calibrate the meter by turning the "mode" control to "redline" and adjusting the "redline" control so the meter needle lines up with the redline on the meter face. If this cannot be accomplished, replace batteries.
2. Plug probe into the probe jack on the side of the instrument.
3. Place probe into sample to be tested. Switch mode control to the X100 scale. If the reading is below 50 on the 0-500 range, switch to the X10 scale. If reading is still below 50, switch to the X1 scale. Record reading and multiply by scale setting to determine total specific conductance.
4. When measuring on the X100 or X10 scales, a cell test may be made to determine if probe is in good operating order. Depress the "Cell Test" button. The meter reading should fall less than 2%. Should it fall more than 2%, the probe is fouled and measurements will be in error. Refer meter and probe to qualified repair technicians.

STANDARD OPERATING PROCEDURE FOR FIELD DECONTAMINATION

This operating procedure describes the MD WMA standard method for decontaminating equipment utilized in environmental sampling of potentially hazardous materials.

The purpose of this operating procedure is to assure uniformity in technician field techniques and will be a means to allow traceability of possible cross-contamination of samples or error in laboratory analytical results.

Specialized equipment required for this procedure would include the following: distilled water, stainless-steel pressure sprayer, 5-gallon stainless-steel bucket, Alconox, bristle scrub brush, long handled bottle brush, aluminum foil, Kimwipes, disposable bags, plastic sheeting.

Decontamination Procedures:

1. Select an area of the site removed from the intended sampling locations and not likely to cause cross-contamination. Stake out a six-foot square of plastic sheeting.
2. Using distilled water in the pressure sprayer, thoroughly wash dirt, mud or particulate material off equipment.
3. Mix decon solution of Alconox (or Liquinox) in bucket with distilled water, 1 gallon of water to 1 cup detergent. Thoroughly wash and scrub equipment.
4. Rinse equipment three times with distilled water and dry with Kimwipes.
5. Wrap the decontaminated equipment in aluminum foil and store for next sample program.
6. Dispose of contaminated water and equipment in accordance with Federal/State Regulations.

Appendix D

Sampling Event Checklist

_____ well surveys
_____ permission forms
_____ bottles
_____ paperwork, chain-of-custody/ traffic reports
_____ tags
_____ custody seals
_____ notebooks
_____ DI water
_____ Preservative (HCL, methanol chloride)
_____ PH buffers
_____ Filters for dissolved metals
_____ Pipets/bulbs
_____ Cups
_____ Scoopula/handle/blades
_____ pH meter
_____ microtip/radiation detector
_____ tyveks
_____ gloves/inner/outer
_____ buckets/brushes/sprayer/liquinox or alkanox
_____ auger/shovel/pick
_____ plastic sheets
_____ bailers/rope
_____ respirator
_____ steel-toe/rubber boots
_____ federal express forms
_____ address labels/return address labels
_____ coolers/ice/DOT placards
_____ ziplock bags/ sandwich and gallon size for paperwork
_____ whirlpacks
_____ vermiculite
_____ duct tape
_____ clear tape
_____ scissors/ utility knife
_____ paper towels
_____ garbage bags
_____ camera/film
_____ emergency phone numbers/cell phone
_____ pagers/walkie talkies